

H1559

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re patent application:

Applicant:	Adam R. Pawloski, et al.	:	Art Unit:	1756
Serial No.:	10/790,457	:	Examiner:	Caleen O. Sullivan
Filed:	01 March 2004	:	Confirmation No.	9956

Title:           METHOD FOR REMOVAL OF IMMERSION LITHOGRAPHY MEDIUM IN  
IMMERSION LITHOGRAPHY PROCESSES

**DECLARATION UNDER 37 C.F.R. §1.131**

**VIA EFS**

M/S Non-Fee Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria VA 22313-1450

Sir:

I, Adam R. Pawloski, declare and say as follows:  
I, Amr Y. Abdo, declare and say as follows:  
I, Gilles R. Amblard, declare and say as follows:  
I, Bruno M. LaFontaine, declare and say as follows:  
I, Ivan Lalovic, declare and say as follows:  
I, Harry J. Levinson, declare and say as follows:  
I, Jeffrey A. Schefske, declare and say as follows:  
I, Cyrus E. Tabery, declare and say as follows:  
I, Frank Tsai, declare and say as follows:

(1) Each of us is a co-inventor of the claimed invention of the above-identified patent application. This Declaration is submitted to establish conception of the invention

described and claimed in the above-identified application in the United States at a date prior to 11 March 2003, which is the U.S. filing date of U.S. Application No. 10/386,356, which was published as U.S. Patent Application Publication No. US 2004/0180299 A1, and diligence, from a time prior to 11 March 2003 until the 01 March 2004 filing date of our present, above-identified U.S. Application No. 10/790,457, at which time our invention was constructively reduced to practice.

(2) To establish completion of the invention claimed in the above-identified application prior to 11 March 2003, copies of two pages of an AMD Invention Disclosure form, which describes completion of the invention in this country, are enclosed with this Declaration as Exhibits A, B, C and D. Exhibits A, B, C and D are four pages of the AMD Invention Disclosure, which was assigned ID# H1559.

(3) Advanced Micro Devices, Inc. ("AMD") is the assignee of the above-identified patent application. The invention described in these Exhibits A, B, C and D was completed prior to 11 March 2003. (The actual dates and certain personal information contained on the Exhibit documents have been removed from the copies submitted herewith.)

(4) Exhibit A is a copy of page 1 of the AMD Invention Disclosure ID# H1559. Exhibit A shows the title of the invention "Low Molecular Weight Fluoropolymers for immersion lithography." While this title is different from that of the patent application, it is descriptive of the field of the invention. Exhibit A also shows that while one of us, Adam R. Pawloski, was identified as the first inventor (as in the above-identified application, the lead inventor), Exhibit A shows "List All Participants Pg 1A" as co-inventors. At the bottom of the page of Exhibit A, the total number of inventors is stated as being "9". The above-referenced Pg 1A is attached hereto as Exhibit C, which shows that the nine inventors are Adam R. Pawloski, Amr Y. Abdo, Gilles R. Amblard, Bruno M. LaFontaine, Ivan Lalovic, Harry J. Levinson, Jeffrey A. Schefske, Cyrus E. Tabery and Frank Tsai. We, the undersigned, are the nine co-inventors indicated in Exhibits A and C.

(5) Exhibit A further indicates that the use of the invention is for "immersion lithography" and that the key search words related to the invention are "immersion fluid" and "supercritical CO<sub>2</sub>".

(6) Exhibit A further shows that the Invention Disclosure was witnessed by two attorneys from the law firm by which our attorney is employed, Renner, Otto, Boisselle & Sklar LLP. These witnessing attorneys are Warren A. Sklar and Thomas W. Adams. The lead attorney for this application is Thomas W. Adams, and Mr. Adams has had responsibility for the present application from the time of conception up to the present. It is our understanding that AMD assigned attorney docket number H1559, and that Mr. Adams' law firm assigned attorney docket number AMDSPH1559US to their file for the above-identified application based on the AMD Invention Disclosure ID# H1559.

(7) Exhibit B is a copy of page 2 of the AMD Invention Disclosure ID# H1559. Exhibit B includes a statement that the problem solved by the invention was that "The fluids used in an immersion lithography system must be removed from the wafer after exposure without leaving residue and by methods that do not heat the wafer." The problem solved by the invention further states that "Supercritical CO<sub>2</sub> can be used to dissolve away these low molecular weight materials without leaving residue or heating the wafer."

(8) Exhibit B includes the following brief description of the invention:

For immersion lithography systems a transparent fluid must be found to fill the space between the photoresist and the objective lens of the optical system.

Fluoropolymers are good choices because they (1) are chemically inert (2) are very transparent at 248 nm, 193 nm and 157 nm and (3) low molecular weight species can be dissolved in supercritical CO<sub>2</sub>

This drying step does not require heating of the resist film (thus not impacting the image formation process after exposure)

(9) Exhibit B includes a diagram illustrating the application of electromagnetic radiation ("exposure light") from a lens through an immersion fluid to a resist including an exposure region, in which the resist is on the surface of a substrate (such as a semiconductor wafer). The diagram indicates that supercritical CO<sub>2</sub> is applied to remove the low molecular weight fluid, leading to (as indicated by the arrow) a dry sample of the substrate and resist, free of the immersion fluid.

(10) The foregoing brief description of the invention in Exhibit B specifically used supercritical CO<sub>2</sub> for the purpose of removing an immersion lithography medium after exposure of a material on the surface of a semiconductor wafer to electromagnetic radiation. This disclosure is the same as what is disclosed and, as we understand, is being claimed, in the above-identified application, of which each of us is a co-inventor.

(11) Exhibit C is a copy of page 1A of the AMD Invention Disclosure ID# H1559. As stated above, Exhibit C, from which personal information has been redacted, lists each of the nine undersigned persons as co-inventors, as referenced on Exhibit A.

(12) Exhibit D is a copy of page 3 of the AMD Invention Disclosure ID# H1559. Exhibit D shows that the stated advantages of the invention over other solutions is "Removal of immersion fluid without leaving residue and without heating the wafer."

(13) In view of Exhibits A, B, C and D, it can be seen that the invention claimed in the above-identified application was conceived in this country prior to 11 March 2003.


(14) From a time prior to 11 March 2003, our attorneys, the assignee Advanced Micro Devices, Inc., and each of us were diligent in constructively reducing the above-identified invention to practice by filing the above-identified application on 01 March 2004. On information and belief, our attorney, Mr. Adams, was actively working on preparation of the above-identified application during the period from when AMD transmitted the invention disclosure shown in Exhibits A, B, C and D together with authorization to prepare a patent application, until Mr. Adams completed the preparation of the draft application and submitted it to us for review. Upon our approval of the draft, our attorney completed the application and submitted it together with the formal papers (Declaration and Power of Attorney, Assignment, etc.) to the AMD legal department. When the AMD legal department received the application and formal papers, they presented these papers to us for execution. After we reviewed and executed the formal papers, the AMD legal department returned the application and executed formal papers to our attorney for filing. On information and belief, our attorney filed the application immediately upon authorization by the AMD legal department. To the best of our knowledge and belief there was no

inactivity with respect to the above-identified application during the period from just prior to 11 March 2003, until the filing date of the above-identified application, 01 March 2004.

Each of us, Adam R. Pawloski, Amr Y. Abdo, Gilles R. Amblard, Bruno M. LaFontaine, Ivan Lalovic, Harry J. Levinson, Jeffrey A. Schefske, Cyrus E. Tabery and Frank Tsai, further sayeth naught. Our signatures are provided on the following page together with the acknowledgment of our responsibilities under the law.

I, Adam R. Pawloski, and I, Amr Y. Abdo, and I, Gilles R. Amblard, and I, Bruno M. LaFontaine, and I, Ivan Lalovic, and I, Harry J. Levinson, and I, Jeffrey A. Schefske, and I, Cyrus E. Tabery, and I, Frank Tsai,, hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

Respectfully submitted,

  
Adam R. Pawloski  
12/13/06  
Date

Amr Y. Abdo  
Date

Gilles R. Amblard  
Date

Bruno M. LaFontaine  
Date

Ivan Lalovic  
Date

Harry J. Levinson  
Date

Jeffrey A. Schefske  
Date

Cyrus E. Tabery  
Date

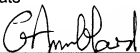
Frank Tsai  
Date

I, Adam R. Pawloski, and I, Amr Y. Abdo, and I, Gilles R. Amblard, and I, Bruno M. LaFontaine, and I, Ivan Lalovic, and I, Harry J. Levinson, and I, Jeffrey A. Schefske, and I, Cyrus E. Tabery, and I, Frank Tsai,, hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

Respectfully submitted,

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Adam R. Pawloski

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Date

  
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Gilles R. Amblard

1/11/2007  
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Date

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Ivan Lalovic

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Date

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Jeffrey A. Schefske

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Frank Tsai

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Amr Y. Abdo

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Ivan Lalovic

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Harry J. Levinson

12-15-2006  
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Jeffrey A. Schefske

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Cyrus E. Tabery

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Frank Tsai

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Frank Tsai

\_\_\_\_\_  
Date

(31) 1-39

TDG LITHO PATENT HARVESTING

Breakout Session: NGL Lithography

Technical Leader: Harry Levinson

Classroom: C-1 & C-2

AMD INVENTION DISCLOSURE

TLD ID# H1559

Rec'd date

California & Asia: x44760, return to MS68;

Texas: x55964 return to MS562;

Dresden & Europe: x83401 Silke Kretzschmar at MS E21-PP

This invention applies to: Project ☐, Product ☐, Process ☒, Technology ☐, Other ☐  
IMPORTANT Please identify any potential use: immersion lithography

List 2 to 5 key search words related to the invention: immersion, fluoropolymer, supercritical CO2

Working title of invention: Low Molecular Weight Fluoropolymers for immersion lithography

INVENTOR/SESSION PARTICIPANT ADDRESS INFORMATION IS ON THE NEXT PAGE (1A)

Inventor's signature: [Signature] date: \_\_\_\_\_

Inventor's printed full name: Adam Pawlaski Citizenship: \_\_\_\_\_

Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone( ) \_\_\_\_\_

AMD email address: \_\_\_\_\_ AMD office FAX( ) \_\_\_\_\_

Division: \_\_\_\_\_ Directorate: \_\_\_\_\_ Dept #: \_\_\_\_\_ Dept : \_\_\_\_\_ Manager: \_\_\_\_\_

Residence address: \_\_\_\_\_

Post Office address: \_\_\_\_\_

Co-Inventor's signature: List All Participants Pg 1A date: \_\_\_\_\_

Co-Inventor's printed full name: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone( ) \_\_\_\_\_

AMD email address: \_\_\_\_\_ AMD office FAX( ) \_\_\_\_\_

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Post Office address: \_\_\_\_\_

Co-Inventor's signature: \_\_\_\_\_ date: \_\_\_\_\_

Co-Inventor's printed full name: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone( ) \_\_\_\_\_

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Residence address: \_\_\_\_\_

Post Office address: \_\_\_\_\_



Co-Inventor's signature: \_\_\_\_\_ date: \_\_\_\_\_

Co-Inventor's printed full name: \_\_\_\_\_ Citizenship: \_\_\_\_\_

Employee #: \_\_\_\_\_ Extension: \_\_\_\_\_ Mail stop: \_\_\_\_\_ Home telephone( ) \_\_\_\_\_

AMD email address: \_\_\_\_\_ AMD office FAX( ) \_\_\_\_\_

Division: \_\_\_\_\_ Directorate: \_\_\_\_\_ Dept #: \_\_\_\_\_ Dept : \_\_\_\_\_ Manager: \_\_\_\_\_

Residence address: \_\_\_\_\_

Post Office address: \_\_\_\_\_

HARVESTING LAW FIRM/ATTORNEYS: RENNER, OTTO, BOISSELLE & SKLAR

State total number of inventors here: 9 Warren Sklar, Tom Adams  
If there are more than four inventors, insert duplicate page 1.

Witness 1 initial: [Signature] Witness 2 initial: [Signature]

Identify known relevant art (patents, publications, other information):

- Supercritical CO<sub>2</sub> (carbon dioxide) extraction of fluorinated species
- Immersion lithography fluids

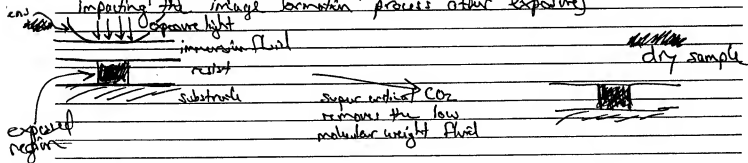
State the problem solved by the invention: The fluid used in an immersion lithography system must be removed from the wafer without leaving residue and by methods that do not heat the wafer. Supercritical CO<sub>2</sub> can be used to dissolve away these low molecular weight materials without leaving residue or heating the wafer.

Brief description and sketch of the invention (please attach copies of documents like AMD patent notebook pages, reports and drawings that are helpful in describing / understanding the invention):

For immersion lithography systems, a transparent fluid must be found to fill the space between the photoresist and the objective lens of the optical system.

⇒ Fluoropolymers are good choices because they ① are chemically inert ② are very transparent at 248nm, 193nm and 157nm and ③ low molecular weight species can be dissolved in supercritical CO<sub>2</sub>

This drying step does not require heating of the resist film (thus not impacting the image formation process after exposure)



Patent notebook # \_\_\_\_\_ Page numbers \_\_\_\_\_ Number of drawings \_\_\_\_\_



Witness 1 initial: \_\_\_\_\_ Witness 2 initial: \_\_\_\_\_

**TDG Litho Patent Harvesting -**

**Breakout Session: NGL Lithography - Classroom: C-1 & C-2**

**Technical Leader: Harry Levinson**

Inventors Name	Email	Citizenship	EE No.	Dept No.	Mail Stop	Work Telephone	Fax No.	Residence Address	Post Office Address
Abdo, Amir Y.	amir.abdo@and.com	Egypt							
Ambler, Gilles R.	gilles.ambler@and.co	France							
LaFontaine, Bruno M.	bruno.lafontaine@and.c	Canada							
LaDovic, Ivan	ivan.ladovic@and.com	USA							
Levinson, Harry J.	harry.levinson@and.co	USA							
Pawloski, Adam R.	adam.pawloski@and.co	USA							
Schelske, Jeffrey A.	jeffrey.schelske@and.co	USA							
Tabery, Cyrus E.	cyrus.tabery@and.com	USA							
Teal, Frank	frank.teal@and.com	Taiwan							



Advantages (check all that apply):

<input checked="" type="checkbox"/> simplifies manufacturing	<input checked="" type="checkbox"/> improves accuracy / precision	<input type="checkbox"/> reduces component parts
<input type="checkbox"/> reduces cost of manufacturing	<input checked="" type="checkbox"/> improves reliability	<input type="checkbox"/> improves signal to noise ratio
<input type="checkbox"/> improves density	<input checked="" type="checkbox"/> improves efficiency	<input checked="" type="checkbox"/> provides new functionality
<input type="checkbox"/> increases operating speed	<input checked="" type="checkbox"/> increases operating range	<input type="checkbox"/> other, explain below

Discussion of advantage(s) of the invention over other solutions

(emphasize technical advance in the art as measured against known art): Removal of immersion fluid without leaving residue and without heating the water.

Please take special care to **preserve documentary evidence of the original date of conception of the invention**. AMD Inventors' notebooks with witness signatures are useful in this regard. Notebooks are issued on request to inventors by the local AMD site Technical Librarian.

Please attach copy of first written description(s) of invention, with dates, names of persons with whom the description was discussed.

Please attach copy of first drawing(s) of invention, with date(s).

Describe any external disclosure of invention, place, date, circumstances of disclosure, with copy of NDA.

None  
Does plan exist to publish, disclose or sell? No ☒, Yes ☐, If yes, where and when? \_\_\_\_\_

Was invention jointly developed with participation of inventors from outside AMD: No ☒, Yes ☐,

If yes, Company name \_\_\_\_\_,

If yes, name of AMD business contact and development contract no. \_\_\_\_\_

**I have read and understood this disclosure and read and signed each page of the attachments:**

**Witness 1**

signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed name: \_\_\_\_\_ Employee #: \_\_\_\_\_

**Witness 2**

signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed name: \_\_\_\_\_ Employee #: \_\_\_\_\_

